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Commentary

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Modern Technology in Respiratory Medicine: Lung Ultrasonography–Is it Time for the Stethoscope to Give Up its Throne?

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The year 2016 marks the 200th anniversary of the invention of the stethoscope by Dr. Réne Théophile Hyacinthe Laennec. He was first inspired in September 1816 when he observed 2 children playing with a long piece of solid wood and a pin. He later made the very first stethoscope when he rolled a paper to listen to the heart sounds of a young woman. He further refined the instrument by constructing it with a hollow tube of wood.[1] Three years later, in 1819, he published a textbook, which has been the foundation of respiratory medicine. In his textbook titled "*De l'Auscultation Médiate ou Traité du Diagnostic des Maladies des Poumonset du Coeur (On Mediate Auscultation or Treatise on the Diagnosis of the Diseases of the Lungs and Heart)*", he introduced the terms that we still use in respiratory medicine, such as "rale", "rhonchi," or "egophony". Laennec founded the basis of modern respiratory medicine with the invention of this remarkable tool. The stethoscope remains an indispensable tool for physicians, and not a single day passes without it being used to examine a patient. However, in the last decade, notable controversies have emerged regarding the utilization of the stethoscope.[2]

It is interesting to learn how this new technology was perceived when Laennec first introduced the stethoscope. While this diagnostic tool was generally well received, as reported by the New England Journal of Medicine in 1821,[3] Simmons described in his book that some physicians rejected this instrument in the 20th century and preferred to apply their ears to their patients.[4]

The history of lung ultrasonography, on the other hand, is relatively new. Lichtenstein published a paper in 1995 that assessed movement of the lung surface to demonstrate the absence of pneumothorax, which has been termed as "lung sliding".[5] He also proposed to assess lung parenchyma itself by utilizing artifacts, such as reverberation artifact and ring-down artifact, which he named A-line and B-line.[6] Given its relatively new history, it may not be surprising that the utilization of lung ultrasonography has not been fully appreciated in the field of internal medicine.[7] Lung ultrasonography is unique in the utilization of artifacts that were often considered to impede the analysis of images.

Diaphragm ultrasonography is another example of a technology that has changed the diagnostic approach to assess diaphragmatic function. Before this imaging modality was developed, it was relatively time consuming and invasive to diagnose diaphragm dysfunction by fluoroscopy or by electromyography. McCool et al[8] reported that with the aid of ultrasonography, the movement of the diaphragm dome and thickening of the diaphragm itself may be directly observed in real time. This can be performed at the bedside in the intensive care unit (ICU) or in the clinic for convenient identification of the presence or absence of diaphragm dysfunction. Though its history is relatively new, ultrasonography is becoming a standard tool in the field of

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pulmonary and critical care medicine. Mayo et al[9] at the American College of Chest Physicians (ACCP) have already recognized its importance and published a statement in competencies of ultrasonography for critical care physicians 7 years ago.

Regarding diagnostic accuracy, the stethoscope may not be as strong a tool as hoped for, especially for trainees. A study by Mangione revealed a striking deficiency in pulmonary auscultatory skills among internal medicine and family practice trainees as they recognized less than half of all respiratory events.[10] He also described "disturbingly low" cardiac auscultatory skills among internal medicine and family medicine trainees since they recognized 20% of all cardiac events.[11] Lung ultrasonography, on the other hand, clearly gives different results. Lichtenstein described in his original article that the absence of lung sliding to detect pneumothorax has extremely high sensitivity of 95.3% and specificity of 91.1% with positive predictive value of 87% and negative predictive value of 100%.[5]

People may have a reasonable concern regarding new technology, as the novelty of using such technology may distract physicians from focusing on their patients. Criticism is often directed towards physicians who tend to care less about the crucial part of data gathering by history and physical examination. While we acknowledge these potential pitfalls of new technologies, we should not deny its potential to revolutionize the world of medicine, as seen with the stethoscope, chest radiograph, or computed tomography, and the potential to create an entire new horizon, as Laennec did with the stethoscope 200 years ago.

In conclusion, the time for the stethoscope to give up its throne to lung ultrasonography may not have arrived; although in the near future, such an occurrence may be likely as the use of lung ultrasonography increases in the world of respiratory medicine. Hopefully, it will follow the path of its predecessor to revolutionize the field of medicine.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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